

What is claimed is:

1. A sulfonated aliphatic-aromatic copolyester comprising an acid component, a glycol component, and 0 to about 5.0 mole percent based on 100 mole% acid component of a polyfunctional branching agent selected from polyfunctional acid, glycol or mixtures thereof, wherein
the acid component comprises
 - 5 a. about 94.9 to about 40.0 mole percent of an aromatic dicarboxylic acid component based on 100 mole percent total acid component, and
 - b. about 5.0 to about 50.0 mole percent of an aliphatic dicarboxylic acid component based on 100 mole percent total acid component, and
 - 15 c. about 0.1 to about 5.0 mole percent of a sulfonate component based on 100 mole percent total acid component, and wherein
the glycol component comprises
 - 20 a. about 100 to about 90.0 mole percent of 1,4-butanediol as a first glycol component based on 100 mole percent total glycol component, and
 - b. 0 to about 5.0 mole percent of one or more of a second glycol component based on 100 mole percent total glycol component.
- 25 2. The sulfonated aliphatic-aromatic copolyester of claim 1, having an inherent viscosity of at least 0.15, as measured on a 0.5 percent solution of the copolyester in a 50:50 solution of trifluoroacetic acid:dichloromethane solvent system at room temperature.
- 30 3. The sulfonated aliphatic-aromatic copolyester of claim 2, wherein said inherent viscosity is at least 0.35 dL/g.

4. The sulfonated aliphatic-aromatic copolyester of claim 1 wherein
said second glycol component is selected from the group
consisting of ethylene glycol, 1,3-propanediol, 1,6-hexanediol,
1,8-octanediol, 1,10-decanediol, 1,12-dodecanediol, 1,14-
tetradecanediol, 1,16-hexadecanediol, dimer diol, 4,8-
bis(hydroxymethyl)-tricyclo[5.2.1.0/2.6]decane, 1,4-
cyclohexanedimethanol, isosorbide, di(ethylene glycol),
tri(ethylene glycol), poly(alkylene ether)glycols in the molecular
weight range of about 500 to about 4000, and mixtures derived
therefrom.
5. The sulfonated aliphatic-aromatic copolyester of claim 1 wherein
said sulfonate component is selected from the group consisting
of metal salts of 5-sulfoisophthalic acid and metal salts of
imethyl 5-sulfoisophthalate.
6. The sulfonated aliphatic-aromatic copolyester of claim 1 wherein
said aromatic dicarboxylic acid component is selected from the
group consisting of: terephthalic acid, dimethyl terephthalate,
bis(2-hydroxyethyl)terephthalate, bis(3-
hydroxypropyl)terephthalate, bis(4-hydroxybutyl)terephthalate,
isophthalic acid, dimethyl isophthalate, bis(2-
hydroxyethyl)isophthalate, bis(3-hydroxypropyl)isophthalate,
bis(4-hydroxybutyl)isophthalate; 2,6-naphthalene dicarboxylic
acid, dimethyl-2,6-naphthalate, 2,7-naphthalenedicarboxylic
acid, dimethyl-2,7-naphthalate, 3,4'-diphenyl ether dicarboxylic
acid, dimethyl-3,4'diphenyl ether dicarboxylate, 4,4'-diphenyl
ether dicarboxylic acid, dimethyl-4,4'-diphenyl ether
dicarboxylate, 3,4'-diphenyl sulfide dicarboxylic acid, dimethyl-
3,4'-diphenyl sulfide dicarboxylate, 4,4'-diphenyl sulfide
dicarboxylic acid, dimethyl-4,4'-diphenyl sulfide dicarboxylate,
3,4'-diphenyl sulfone dicarboxylic acid, dimethyl-3,4'-diphenyl
sulfone dicarboxylate, 4,4'-diphenyl sulfone dicarboxylic acid,

- dimethyl-4,4'-diphenyl sulfone dicarboxylate, 3,4'-
benzophenonedicarboxylic acid, dimethyl-3,4'-
benzophenonedicarboxylate, 4,4'-benzophenonedicarboxylic
acid, dimethyl-4,4'-benzophenonedicarboxylate, 1,4-
naphthalene dicarboxylic acid, dimethyl-1,4-naphthalate, 4,4'-
methylene bis(benzoic acid), dimethyl-4,4'-
methylenebis(benzoate), and mixtures derived therefrom.
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7. The sulfonated aliphatic-aromatic copolyester of claim 1,
10 wherein the acid component comprises from about 80 to about
50 mole percent of said aromatic dicarboxylic acid component.
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8. The sulfonated aliphatic-aromatic copolyester of claim 1,
wherein said aliphatic dicarboxylic acid component is selected
from the group consisting of oxalic acid, dimethyl oxalate,
malonic acid, dimethyl malonate, succinic acid, dimethyl
succinate, methylsuccinic acid, glutaric acid, dimethyl glutarate,
bis(2-hydroxyethyl)glutarate, bis(3-hydroxypropyl)glutarate,
bis(4-hydroxybutyl)glutarate, 2-methylglutaric acid, 3-
20 methylglutaric acid, adipic acid, dimethyl adipate, bis(2-
hydroxyethyl)adipate, bis(3-hydroxypropyl)adipate, bis(4-
hydroxybutyl)adipate, 3-methyladipic acid, 2,2,5,5-
tetramethylhexanedioic acid, pimelic acid, suberic acid, azelaic
acid, dimethyl azelate, sebacic acid, 1,11-undecanedicarboxylic
25 acid, 1,10-decanedicarboxylic acid, undecanedioic acid, 1,12-
dodecanedicarboxylic acid, hexadecanedioic acid,
docosanedioic acid, tetracosanedioic acid, dimer acid, and
mixtures derived therefrom.
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9. The sulfonated aliphatic-aromatic copolyester of claim 1 wherein
said aliphatic dicarboxylic acid component is selected from the
group consisting of succinic acid, dimethyl succinate, glutaric
acid, dimethyl glutarate, bis(2-hydroxyethyl)glutarate, bis(3-
hydroxypropyl)glutarate, bis(4-hydroxybutyl)glutarate, adipic

acid, dimethyl adipate, bis(2-hydroxyethyl)adipate, bis(3-hydroxypropyl)adipate, bis(4-hydroxybutyl)adipate and mixtures derived therefrom.

- 5 10. The sulfonated aliphatic-aromatic copolyester of claim 1, wherein the acid component comprises from about 20 to about 50 mole percent of said aliphatic dicarboxylic acid component.
- 10 11. The sulfonated aliphatic-aromatic copolyester of claim 1, wherein said branching agent is selected from the group consisting of: 1,2,4-benzenetricarboxylic acid; trimethyl-1,2,4-benzenetricarboxylate; tris(2-hydroxyethyl)-1,2,4-benzenetricarboxylate; tris(3-hydroxypropyl)-1,2,4-benzenetricarboxylate; tris(4-hydroxybutyl)-1,2,4-benzenetricarboxylate; 1,2,4-benzenetricarboxylic anhydride; 1,3,5-benzenetricarboxylic acid; 1,2,4,5-benzenetetracarboxylic acid; 1,2,4,5-benzenetetracarboxylic dianhydride; 3,3',4,4'-benzophenetetracarboxylic dianhydride; 1,4,5,8-Naphthalenetetracarboxylic dianhydride; citric acid; tetrahydrofuran-2,3,4,5-tetracarboxylic acid; 1,3,5-cyclohexanetricarboxylic acid; pentaerythritol; Glycerol; 2-(hydroxymethyl)-1,3-propanediol; 2,2-bis(hydroxymethyl)propionic acid; and mixtures derived therefrom.
- 15 20 25 12. The sulfonated aliphatic-aromatic copolyester of claim 1, having an inherent viscosity of at least about 0.15 dL/g.
- 20 30 13. The sulfonated aliphatic-aromatic copolyester of claim 1, having an inherent viscosity of at least about 0.35 dL/g.
- 25 14. The sulfonated aliphatic-aromatic copolyester of claim 1, having an inherent viscosity of at least about 0.65 dL/g.

15. The sulfonated aliphatic-aromatic copolyester of claim 1, further comprising a filler.
16. The sulfonated aliphatic-aromatic copolyester of claim 15,
5 wherein said filler comprises a first set of particles having a first average particle size, and a second set of particles having a second average particle size, and wherein second average particle size is at least about 2 times that of said first average particle size.
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17. The sulfonated aliphatic-aromatic copolyester of claim 15,
wherein said filler consists essentially of particles having an average diameter less than about 40 microns.
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18. The sulfonated aliphatic-aromatic copolyester of claim 15,
wherein said filler consists essentially of particles having an average diameter less than about 20 microns.
19. A blend comprising a sulfonated aliphatic-aromatic copolyester
20 of claim 1 and at least one other polymer.
20. The blend of claim 19 wherein said other polymer is biodegradable.
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21. The blend of claim 20 wherein said biodegradable polymer is selected from the group consisting of poly(hydroxy alkanoates), polycarbonates, poly(caprolactone), aliphatic polyesters, aliphatic-aromatic copolyesters, aliphatic-aromatic copolyetheresters, aliphatic-aromatic copolyamideesters, sulfonated aliphatic-aromatic copolyesters, sulfonated aliphatic-aromatic copolyetheresters, sulfonated aliphatic-aromatic copolyamideesters, and mixtures derived therefrom.
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22. The blend of claim 19 wherein said other polymer is nonbiodegradable.
- 5 23. The blend of claim 19 wherein said other polymer is a natural polymer.
- 10 24. The blend of claim 23 wherein said natural polymer is a starch.
- 15 25. A shaped article formed from a sulfonated aliphatic-aromatic copolyester of claim 1.
- 20 26. A shaped article of claim 25 selected from the group consisting of films, sheets, fibers, melt blown containers, molded parts, and foamed parts.
- 25 27. A film comprising the sulfonated aliphatic-aromatic copolyester of claim 1.
- 30 28. The film of claim 27, having a thickness from about 0.025 mm to about 0.15 mm.
- 30 29. An oriented film according to claim 27.
- 30 30. The film of claim 29 wherein said film is biaxially oriented.
- 30 31. The film of claim 29 wherein said film is uniaxially oriented
- 30 32. A multilayer film comprising a layer comprising a sulfonated aliphatic-aromatic copolyester of claim 1.
- 30 33. An article comprising a substrate and a coating on said substrate, said coating comprising an aliphatic-aromatic copolyetherester of claim 1.

34. The article of claim 33 wherein said coating has a thickness from about 0.2 to about 15 mils.
- 5 35. The article of claim 33 wherein said coating has a thickness from about 0.5 to about 2 mils.
- 10 36. The article of claim 33 wherein said substrate is selected from the group consisting of textiles, nonwovens, foil, paper, paperboard, and metals.
- 15 37. An article comprising a substrate having laminated thereon a sulfonated aliphatic-aromatic copolyester of claim 1.
38. The article of claim 37 wherein said substrate is selected from the group consisting of paper, paperboard, cardboard, fiberboard, cellulose, starch, plastic, polystyrene foam, glass, metals, polymeric foams, organic foams, inorganic foams, organic-inorganic foams, and polymeric films.
- 20 39. A package comprising an article of claim 37.
40. A wrap comprising a sulfonated aliphatic-aromatic copolyester of claim 1.
- 25 41. A sheet comprising a sulfonated aliphatic-aromatic copolyester of claim 1.
42. The sheet of claim 41, having a thickness of at least about 0.50 mm.
- 30 43. A fiber comprising a sulfonated aliphatic-aromatic copolyester of claim 1.

44. The fiber of claim 43 having a denier from about 0.1 to about 100.
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45. The fiber of claim 43 having a denier from about 0.5 to 20.
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46. A fiber comprising a sulfonated aliphatic-aromatic copolyester of claim 1 and at least one other polymer.
47. The fiber of claim 43 wherein said fiber comprises a blend of said sulfonated aliphatic-aromatic copolyester and one or more natural fibers.
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48. The fiber of claim 43 wherein said fiber is a heterogeneous fiber.
50. A shaped article formed from a sulfonated aliphatic-aromatic copolyester of claim 15.
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51. A shaped article of claim 50 selected from the group consisting of films, sheets, fiber, melt blown containers, molded parts, and foamed parts.
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52. A film comprising a sulfonated aliphatic-aromatic copolyester of claim 15.
53. The film of claim 52, having a thickness from about 0.025 mm to about 0.15 mm.
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54. An oriented film according to claim 52.
55. A multilayer film comprising a layer comprising a sulfonated aliphatic-aromatic copolyester of claim 15.

- 5 56. An article comprising a substrate and a coating on said substrate, said coating comprising a sulfonated aliphatic-aromatic copolyester of claim 15.
- 10 57. An article comprising a substrate having laminated thereon a sulfonated aliphatic-aromatic copolyester of claim 15.
- 15 58. A wrap comprising a sulfonated aliphatic-aromatic copolyester of claim 15.
- 20 59. A sheet comprising a sulfonated aliphatic-aromatic copolyester of claim 15.
- 25 60. A foamed article comprising a sulfonated aliphatic-aromatic copolyester of claim 19.
- 30 61. A shaped article formed from a sulfonated aliphatic-aromatic copolyester of claim 19.
- 35 62. A shaped article of claim 61 selected from the group consisting of films, sheets, fiber, melt blown containers, molded parts, and foamed parts.
- 40 63. A film comprising a sulfonated aliphatic-aromatic copolyester of claim 19.
- 45 64. The film of claim 63, having a thickness from about 0.025 mm to about 0.15 mm.
- 50 65. An oriented film according to claim 63.
- 55 66. A multilayer film comprising a layer comprising a sulfonated aliphatic-aromatic copolyester of claim 19.

67. An article comprising a substrate and a coating on said substrate, said coating comprising a sulfonated aliphatic-aromatic copolyester of claim 19.
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68. An article comprising a substrate having laminated thereon a sulfonated aliphatic-aromatic copolyester of claim 19.
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69. A wrap comprising a sulfonated aliphatic-aromatic copolyester of claim 19.
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70. A sheet comprising a sulfonated aliphatic-aromatic copolyester of claim 19.
71. A foamed article comprising a sulfonated aliphatic-aromatic copolyester of claim 19.
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72. A shaped article formed from a sulfonated aliphatic-aromatic copolyester of claim 19.
73. A shaped article of claim 72 selected from the group consisting of films, sheets, fiber, melt blown containers, molded parts, and foamed parts.
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74. A film comprising a sulfonated aliphatic-aromatic copolyester of claim 19.
75. The film of claim 74, having a thickness from about 0.025 mm to about 0.15 mm.
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76. An oriented film according to claim 75.
77. A multilayer film comprising a layer comprising a sulfonated aliphatic-aromatic copolyester of claim 19.

78. An article comprising a substrate and a coating on said substrate, said coating comprising a sulfonated aliphatic-aromatic copolyester of claim 19.
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79. An article comprising a substrate having laminated thereon a sulfonated aliphatic-aromatic copolyester of claim 19.
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80. A wrap comprising a sulfonated aliphatic-aromatic copolyester of claim 19.
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81. A sheet comprising a sulfonated aliphatic-aromatic copolyester of claim 19.
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82. A foamed article comprising a sulfonated aliphatic-aromatic copolyester of claim 23.
83. A shaped article formed from a sulfonated aliphatic-aromatic copolyester of claim 23.
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84. A shaped article of claim 83 selected from the group consisting of films, sheets, fiber, melt blown containers, molded parts, and foamed parts.
85. A film comprising a sulfonated aliphatic-aromatic copolyester of claim 23.
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86. The film of claim 85, having a thickness from about 0.025 mm to about 0.15 mm.
87. An oriented film according to claim 85.
88. A multilayer film comprising a layer comprising a sulfonated aliphatic-aromatic copolyester of claim 23.

89. An article comprising a substrate and a coating on said substrate, said coating comprising a sulfonated aliphatic-aromatic copolyester of claim 23.
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90. An article comprising a substrate having laminated thereon a sulfonated aliphatic-aromatic copolyester of claim 23.
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91. A wrap comprising a sulfonated aliphatic-aromatic copolyester of claim 23.
92. A sheet comprising a sulfonated aliphatic-aromatic copolyester of claim 23.
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93. A process for producing a package, comprising providing a substrate; forming said substrate into a desired package form; providing a sulfonated aliphatic-aromatic copolyester consisting essentially of an acid component, a glycol component, and 0 to about 5.0 mole percent based on 100 mole% acid component of a polyfunctional branching agent selected from polyfunctional acid, glycol or mixtures thereof, wherein
the acid component comprises
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- a. about 94.9 to about 40.0 mole percent of an aromatic dicarboxylic acid component based on 100 mole percent total acid component, and
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- b. about 5.0 to about 50.0 mole percent of an aliphatic dicarboxylic acid component based on 100 mole percent total acid component, and
- c. about 0.1 to about 5.0 mole percent of a sulfonate component based on 100 mole percent total acid component, and wherein
the glycol component comprises
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- a. about 100 to about 90.0 mole percent of 1,4-butanediol as a first glycol component based on 100 mole percent total glycol component, and
- b. 0 to about 5.0 mole percent of one or more of a second glycol component based on 100 mole percent total glycol component; and
- laminating or coating said substrate with said sulfonated aliphatic-aromatic copolyester to form said package.
- 10 94. The process of claim 93 wherein said substrate comprises a material selected from the group consisting of paper, paperboard, inorganic foams, organic foams, and inorganic-organic foams.
- 15 95. The process of claim 93 wherein said package form is selected from the group consisting of wrappers, stretch wrap films, bags, cups, trays, cartons, boxes, bottles, crates, packaging films, blister pack wrappers, skin packaging, and hinged containers.
- 20 96. A process for producing a sulfonated aliphatic-aromatic copolyester, comprising providing a reaction mixture comprising an aromatic dicarboxylic component, an aliphatic dicarboxylic acid component, a sulfonate component, a first glycol component consisting essentially of 1,4-butanediol, optionally a second glycol component, and optionally a polyfunctional branching agent; and allowing said aromatic dicarboxylic acid component, said aliphatic dicarboxylic acid component, said sulfonate component, said first glycol component, said second glycol component and said polyfunctional branching agent to polymerize to form a sulfonated aliphatic-aromatic copolyester comprising an acid component, and a glycol component, wherein
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- the acid component comprises

- 5 a. about 94.9 to about 40.0 mole percent of an aromatic dicarboxylic acid component based on 100 mole percent total acid component, and
- 5 b. about 5.0 to about 50.0 mole percent of an aliphatic dicarboxylic acid component based on 100 mole percent total acid component, and
- 5 c. about 0.1 to about 5.0 mole percent of a sulfonate component based on 100 mole percent total acid component, and wherein
- 10 the glycol component comprises
- 10 a. about 100 to about 90.0 mole percent of 1,4-butanediol as a first glycol component based on 100 mole percent total glycol component.
- 15 97. The process of claim 96, comprising providing said second glycol component in a quantity such that the glycol component of said polyester comprises up to 5.0 mole percent of said second glycol component, based on the total of said first glycol component and said second glycol component.
- 20 98. The process of claim 96, comprising providing said polyfunctional branching agent in a quantity such that said polyester comprises up to 5.0 mole percent of said polyfunctional branching agent, based on the total of said first glycol component, said second glycol component, and said polyfunctional branching agent.
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